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METHOD FOR THE PRODUCTION OF AN OPTICAL FIBER

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In preform production, especially according to an MCVD method for optical fibers, a core layer, which acts as a protective layer, is applied to the corresponding series of layers; specifically said core layer prevents a disturbing refractive index "dip" in the finished optical fiber.

Claims

1. Method for the production of an optical fiber made of a glass or quartz glass tube, on whose inside surface a glassy and/or glass-forming series of layers is placed, characterized in that at least one protective layer (3) is applied to the series of layers (2); said protective layer prevents

the evaporation of a component that is contained in the series of layers (2) in a subsequent collapsing and/or drawing process.

2. Method according to Claim 1, characterized in that as a protective layer (3), a doping substance containing quartz glass is used, which is suitable as the innermost core layer of the optical fiber, and that the doping substance and/or the collapsing and/or drawing method are selected in such a way that an evaporation of the doping substance is prevented.

3. Method according to Claim 1 or 2, characterized in that the doping agent is selected in such a way that a dip in the refractive in the middle of the core of the optical fiber is prevented.

4. Method according to one of the preceding claims, characterized in that the protective layer (3) contains silicon nitride (Si_3N_4).

5. Method according to one of the preceding claims, characterized in that the protective layer (3) contains silicon, which is converted, at least partially, into silicon nitride (Si_3N_4) in a subsequent process.

6. Method according to one of the preceding claims, characterized in that the protective layer contains titanium and/or aluminum oxide.

7. Method according to one of the preceding claims, characterized in that as a protective layer (3), a metal film, containing aluminum and/or titanium, is first applied, which is converted into an aluminum and/or titanium oxide film is a subsequent oxidation process.

8. Method according to one of the preceding claims, characterized in that as a protective layer (3), a material is used, which after the drawing process, has a refractive index, which, preferably, does not differ substantially from that of the adjacent core glass, and that after the drawing process, the protective layer (3) has a diameter, which is smaller than half the wavelength of the light to be transmitted by the optical fiber.

9. Method according to one of the preceding claims, characterized in that upon application of the protective layer (3), a protective gas is used that prevents the formation of OH^- ions.

10. Method according to one of the preceding claims, characterized in that the protective layer (3) is produced by a pyrolytic process.

11. Method according to one of the preceding claims, characterized in that the protective layer (3) is produced by a high-frequency plasma process.

12. Method according to one of the preceding claims, characterized in that the protective layer (3) is applied before and/or during the collapsing process.

13. Method according to one of the preceding claims, characterized in that the protective layer (3) is applied before and/or during the drawing process of the optical fiber from the preform tube.

Description

"Method for the production of an optical fiber"

The invention concerns a method for the production of an optical fiber according to the preamble of Claim 1.

Such a method is designated also as an MCVD (modified chemical vapor deposition) method. Preforms produced with such a method are collapsed and drawn to form an optical fiber, which essentially consists of a light-conducting, rod-shaped core and a surrounding cladding. The longitudinal axis of the optical fiber is essentially coincident with its optical axis. In particular, with optical fibers for the optical transmission of information, it is necessary for the refractive index profile, measured along the diameter to have a certain profile, for example, parabolic in the core area in order to attain a high bandwidth. Deviations from this, for example, a refractive index "dip" in the area of the longitudinal axis, are undesirable. Such a dip in the refractive is formed in that during the collapsing and/or drawing process of the optical fiber from the innermost layer of the applied series of layers, glass-forming components, for example, germanium oxide, evaporate. In this way, the refractive index of the innermost layer is reduced. Such a dip in the refractive is avoidable in that during the collapsing and/or drawing process, a certain partial pressure is maintained within the preform, for example, by a gas mixture with a corresponding composition. Such a method can be controlled only with difficulty and disadvantageously. With an excessively high partial pressure, an undesired refractive index increase, which also produces an uneconomical transmission of information, is formed in the area of the longitudinal axis.

The goal of the invention is, therefore, to indicate a low-cost and reliable method for the production of optical fibers which are particularly suitable for the optical transmission of information at a high data rate.

This goal is attained by the features indicated in the characterizing portion of Claim 1.

Refinements of the invention can be deduced from the subordinate claims.

The invention will be explained in more detail below with the aid of an embodiment example and reference to a schematic drawing.

The figure shows a longitudinal section through a preform before the collapsing and/or drawing process. A series of layers 2 made of variously doped quartz glass is applied, for example, according to the MCVD method, to the inside surface of a carrier tube 1 made of quartz glass. The inside cladding, the core and its refractive index profile--for example, that of a graded optical fiber--are produced by this series of layers 2. In accordance with the invention, at least one protective layer 3 is applied to the series of layers 2 as the innermost layer, for example, with the aid of the MCVD method, a quartz glass layer, interspersed with a hard-to-volatilize doping agent. The doping agent, for example, silicon nitride (Si_3N_4) and/or aluminum oxide and/or a

titanium oxide is selected in such a way that on the one hand, an adaptation of the refractive index and the thickness of the protective layer 3 to the series of layers 2 is possible and, on the other and, an evaporation of components, for example, germanium oxide, from the series of layers is prevented. The evaporation is otherwise possible in the collapsing and/or drawing process, which takes place at approximately 2000°. The protective layer 3 produces the innermost core layer (surrounding the longitudinal axis) of the optical fiber in this embodiment example.

In accordance with the desired refractive index profile, it is also possible to apply a protective layer made of pure doping agent, for example, an extremely thin layer of Si_3N_4.

Surprisingly, it is even possible to select a protective layer, whose refractive index differs substantially from that of the adjacent layer. In this embodiment example, it is appropriate to select the thickness of the protective layer in such a way that in the finished optical fiber, the innermost core layer has a diameter which is smaller than half the wavelength of the light to be transmitted. A dip in the refractive arises, for example, which produces merely negligible optical influences, however.

Furthermore, it is possible to select the thickness and/or chemical composition of the protective layer in such a way that it essentially completely evaporates the layer during the collapsing and/or drawing process, whereas, however, the components of the series of layers to be protected are essentially retained.

The invention is not limited to the embodiment examples described, but can be applied analogously to other methods for the production of optical fibers, for example, to a so-called external MCVD method, in which a corresponding series of layers is applied to the external surface of a carrier tube or rod.

[stamp:] Subsequently submitted